The Veterinary Record.

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

NO. 37. SEPTEMBER 13, 1930. VOL. 10.

Observations on the Double Intradermal Tuberculin Test.*

By R. E. Glover, B.Sc., M.R.C.V.S., Institute of Animal Pathology, University of Cambridge.

During the six years which have elapsed since the double intradermal test was first introduced into this country, practitioners have had many opportunities of acquiring a knowledge of the method of application and interpretation of the test. Nevertheless, some veterinary surgeons are still encountering difficulties either in regard to the technique of the inoculations, or else in the differentiation of the reactor from the non-reactor.

Attention may be drawn to the admirable report[1] which was issued in 1928 by Professor Buxton and Dr. MacNalty, members of the Tuberculin Committee of the Medical Research Council, in which the replies to a questionnaire sent to a number of veterinary surgeons, who were using the test, were carefully analysed. This report is worthy of a close study, for in it will be found the answers to many of the perplexities which arise in the conduct of the test. It is hoped, however, that the following notes, which have been inspired through a personal contact with practitioners who have experienced disappointing results, may elucidate some of the misunderstandings which still exist.

Technique.

It is unnecessary to outline the technique of the test, as the methods have been described on several occasions in veterinary periodicals and in other publications[1, 2, 3]. There is, however, one possible source of error which seems to require special mention. It will be remembered that in the original report[2] of the Tuberculin Committee, it was pointed out that the depth of the inoculation influences the subsequent reaction, and it was recommended that the tuberculin should be injected into the deeper layers of the skin. Comparative experiments have shown that in the tuberculous animal the swelling which follows a deep implantation of the tuberculin, is more marked than that which is produced by a superficial inoculation. In their efforts to avoid the danger of penetrating the skin, some operators are prone to inject the tuberculin too near the surface. This error can be avoided if a generous fold of skin is taken firmly between the thumb and fingers and the needle is plunged boldly into this fold; the tuberculin will then reach the deeper strata of the derma, where it will produce the most characteristic reaction. If the needle inadvertently penetrates the skin, the accident is immediately evidenced by (*a*) the absence of back pressure on the plunger of the syringe; and (*b*) the non-appearance in the skin of a pea-like swelling, which is easily detected by passing a finger over the point of the inoculation.

* Paper presented to the Eastern Counties Division, N.V.M.A., at Cambridge, on July 25th, 1930.

Necessity of the Diagnostic Dose.

The importance of the second inoculation has been especially stressed from time to time, and the accumulated experience of six years has but served to confirm the wisdom of the Tuberculin Committee in advocating this procedure. Nevertheless, some practitioners are still of the opinion that the second dose is either entirely unnecessary, or is only required when there is a palpable difference in the size of the swelling at the forty-eighth hour; if the enlargement is " pea-like " at this period, they omit the diagnostic inoculation on the ground that, in their experience, an animal which shows no evidence of a reaction to the sensitising dose, never reacts to the second dose. This contention is not borne out in practice, and it cannot be too strongly urged that the omission of the second dose will result in the escape of a certain proportion of tuberculous animals. The records of this Institute show innumerable instances of cases in which there was an entire lack of reaction at the forty-eighth hour, but in which the diagnostic dose produced a definitely positive reaction. The proportion of tuberculous animals which react in this manner varies largely in the different herds; the average seems to be in the neighbourhood of 5 per cent. although, on occasion, it may rise to 20 or 30 per cent.

Interpretation of the Reactions.

On previous occasions, an endeavour has been made to point out the differential characteristics of the swellings in positive and negative animals, *i.e.*, to describe the non-reacting swelling as small, definitely circumscribed and of the nature of a " pea " or " small bean," and to contrast it with the diffuse or slightly diffuse, œdematous swelling, sometimes accompanied by heat and tenderness, which is the feature of the reacting animal. In spite of the efforts which have been made to lay down these distinctions, experience in the field has convinced us that many practitioners are still unable to draw a distinction between reactor and non-reactor. The causes of these failures may be conveniently grouped under four headings.

(*a*) ADOPTION OF THREE STANDARDS.

Much confusion has arisen because some observers recognise a percentage of doubtful cases, *i.e.*, they divide their results into three classes: reactor, doubtful reactor or doubtful non-reactor, and non-reactor. Such a classification is quite indefensible and makes " confusion worse confounded," for the wider the application of the test, the greater the uncertitude in the mind of the operator and the greater the percentage of doubtful cases.

(*b*) CLASSIFICATION OF SLIGHTLY DIFFUSE SWELLINGS AS NEGATIVE REACTIONS.

It has been found that in certain herds, a proportion of the animals have presented slightly diffuse swellings but have, nevertheless, been classed as non-reactors. In these

DEPT. OF VET. MEDICINE

cases, the veterinary surgeons applying the test have been unaware that they were misinterpreting the results. They have been at fault because they have failed to fix in their minds the characteristic nature of the non-reacting swelling; in consequence, they have regarded slightly diffuse swellings as non-reactions. In this connection, it must be borné in mind that although tuberculous animals sometimes present comparatively large diffuse swellings measuring up to 30 mm. or 40 mm. in size, it must not be thought that all positive reactions are of this nature; in many cases there is only a slight degree of diffuseness, and careful palpation is necessary in order to detect the difference between the positive and negative swelling.

(*c*) Over-Estimation of the Importance of Pain and Heat.

A much graver error arises through a belief that, in the reacting animal, tenderness and heat are the cardinal features and that, in their absence, diffuseness can be ignored. This mistake has led some observers to consider comparatively large diffuse swellings, measuring 20 mm. to 30 mm. in size, as negative reactions because pain and heat were lacking. These manifestations must be regarded as subsidiary and if the swelling exhibits any tendency towards diffuseness, the animal must be regarded as a reactor.

(*d*) Reliance Placed on Measurements Alone.

Some workers depend to a great extent upon the measurements of the swellings and have refused to condemn an animal unless the final skin measurement was at least double the size of the initial fold, irrespective of the character of the swelling. Thus, if the measurements at the time of inoculation, at the forty-eighth hour and at the seventy-second hour should be, for example, 8 mm., 12 mm. and 15 mm., or 7 mm., 10 mm. and 13 mm.., respectively, they would class the animals as non-reactors. It must be emphasised that the measurements are only an aid to the formulating of an opinion and must be considered in conjunction with the nature of the swellings. A dependance upon measurements alone is misleading, and will result in the passing of animals which should be rejected.

It is suggested that these difficulties which have been encountered in the interpretation of the test, have arisen through a failure *to fix in the mind the characteristics of the non-reacting swelling*; in addition, too much attention has been paid to differences in the size and nature of the swellings in reacting animals. It is impossible to interpret the test with satisfaction unless the operator has always before him the type of reaction in the non-tuberculous animal. If there is any doubt on this point, the nature of the non-reacting swelling can be definitely determined by the inoculation of a concentrated glycerine broth,* *i.e.*, a liquid which is identical with tuberculin except that it lacks the specific principle. When applying the test to a herd, two areas may be prepared on the neck of each animal; the concentrated glycerine broth is inoculated into one place and tuberculin into the other (care must be taken to avoid admixture of the glycerine broth with the tuberculin). Each animal, irrespective of whether it is tuberculous or not, will then present a swelling which corresponds with the non-reaction (glycerine broth), and a specific swelling (tuberculin). *If the two swellings differ in the slightest degree, the animal is tuberculous.* The double intradermal test can be correctly interpreted only when this non-reacting swelling is firmly fixed in the mind; any deviation from it, irrespective of size, heat, etc., must then be regarded as a positive reaction. There can be no doubt that the majority of so-called "doubtful reactions" are positive reactions; it is equally probable that many of the alleged non-reactors in which the final measurements are almost double the initial measurements should be placed in the same category.

* Concentrated glycerine broth can be obtained on application to the Director, Institute of Animal Pathology, Cambridge.

Potency of Tuberculin.

The need for a tuberculin of adequate potency has been reiterated by Professor Buxton on many occasions[1, 4]. It has been clearly shown at this Institute that there are brands of tuberculin on the market which are definitely of low potency; a few, indeed, are actually inert. A potent tuberculin is essential if well-defined reactions are to be obtained, for tuberculins of low value are often responsible for the unsatisfactory results which have troubled certain practitioners. If the best results are to be obtained from the test, it is important to insist upon a tuberculin of proved potency.

. . . .

References.

[1]*The Intradermal Tuberculin Test in Cattle (Collected Results of Experience).* J. B. Buxton and A. S. MacNalty. Medical Research Council. Spec. Rept. Series, No. 122. London: H.M. Stationery Office. 1928.

[2]*Tuberculin Test in Cattle with Special Reference to the Intradermal Test.* Medical Research Council. Spec. Rept. Series No. 94. London: H.M. Stationery Office. 1925.

[3]*The Double Intradermal Tuberculin Test in Cattle.* J. B. Buxton, *Veterinary Record,* 1925. 5, 582.

[4]*A Potency Test for Tuberculin.* J. B. Buxton, *Veterinary Record,* 1925. 5, 587.

Foot-and-Mouth Disease Outbreak near Leeds.

The existence of foot-and-mouth disease was confirmed by the Ministry of Agriculture at Holbeck, Leeds, at the end of last week, when the usual prohibition of movement order was issued. Two cases of the disease in pigs were confirmed originally, but over the week-end, in the city itself, two further outbreaks in swine were confirmed.

Captain Petrie, Divisional Inspector of the Board of Agriculture, is in Leeds with a full staff of inspectors, and hopes are entertained that the outbreak will be kept in check.

The markets and other centres affected include Leeds, Whitkirk, Wetherby, Tadcaster, Pontefract, Wakefield, Bradford, Otley, Barnsley, Dewsbury, Halifax, Huddersfield, Batley, Brighouse, Morley, and Ossett.

Until this outbreak Great Britain had been free from foot-and-mouth disease since December 23rd, 1929, when the last case was confirmed.

The Intradermal Tuberculin Testing of Cattle.*

By K. D. Downham, B.V.Sc. (Liverpool), M.R.C.V.S., D.V.H., Department of Veterinary Pathology, Liverpool University.

When the Secretary of this Division of the N.V.M.A. invited me to address you upon Intradermal Tuberculin Testing of Cattle, I felt that, as the subject was of great importance to the veterinary profession, I must accept the invitation. I greatly appreciate the honour which the North Wales Society has accorded me, and hope that a discussion of this means of application of the tuberculin test may be to our mutual advantage.

A great responsibility rests on the veterinary surgeon who carries out the test, for it is upon his skill in the performance of this task, and upon his interpretation of the result, that tubercle-free herds are established and maintained. The health of the community is dependent in no small measure upon the veterinarian's knowledge of tuberculin testing. Eradication of tuberculosis from our herds can only be effected by careful systematic testing with tuberculosis, and by the co-operation of stockowners, the veterinary profession and the various authorities concerned.

The tuberculin test is among the most dependable tests for the presence of disease, and in its general application the percentage of error is very small. We are, indeed, fortunate in having so accurate a means of diagnosing such a devastating scourge as tuberculosis in cattle in its early stages, and it is surprising that it has not been more widely used in this country. Recently there has been evidence by agriculturists, health authorities and others, of a greater interest in the subject of eradication of tuberculosis in cattle, and I have no doubt the veterinary profession are fully alive to their responsibilities in the matter, and are ready to fulfil their important part of diagnosing the condition by means of the tuberculin test.

I consider the intradermal method of testing cattle with tuberculin to be the most satisfactory for general use. I do not propose to discuss here in detail the advantages and disadvantages of the subcutaneous, ophthalmic and intradermal methods. The various tests have their special advantages for use in certain circumstances, but when one takes into consideration the fact that the intradermal method, whilst being quite as accurate as the other methods for testing a herd under ordinary conditions, has the advantage of eliminating the effect of desensitization by means of " doping " or previous injection of tuberculin, and is also a means of saving a considerable amount of the operator's time, and can be performed irrespective of any reasonable variation of the temperature of the animal, it is evident that the intradermal method has some important advantages over the others.

Accuracy of the Intradermal Test.

Twenty years ago Joseph applied the intradermal test in 126 animals; 78 of these gave positive reactions and in 77 of the reacting animals, and in one which gave a doubtful reaction, tuberculous lesions were found on *post-mortem* examination. The 48 animals which gave negative reactions were all found to be free from tuberculosis when slaughtered. Since then several workers have shewn that the intradermal test has a very high degree of accuracy, when careful *post-mortem* and biological tests have been made on animals subjected to the test.

The Double Intradermal Test.

The double intradermal test is carried out in two steps. The thickness of a fold of the skin at a selected site on the side of the neck is measured with calipers or other suitable measuring device and recorded, after the hair has been clipped or shaved from an area of about two inches square. The preliminary sensitizing dose of 0·1 of concentrated tuberculin is then introduced into the deeper layers of the skin by means of a dental syringe with a needle of very fine bore. Forty-eight hours afterwards the site is again measured and a second or diagnostic dose is injected into the centre of the swelling produced by the first inoculation. Twenty-four hours later the swelling is carefully measured and palpated. A tuberculous animal presents a diffuse, œdematous and tender swelling · a non-reactor, on the other hand, has a hard, circumscribed painless swelling. My experience has been that when an animal gives a reaction which may be considered doubtful it is almost invariably a tuberculous animal. Greater attention should be given to the type of swelling than to its size, although the size should be noted and recorded at the time of the first injection, at the 48th hour and at the 72nd hour. Occasionally it is advisable to examine the swelling at the 96th hour, for in a few cases it is found to be more definite at that time that at the 72nd hour when the decision is normally made.

It is important to remember that when performing the intradermal test the best results are obtained by injecting tuberculin into the deeper layers of the skin. With a little practice this is easily accomplished and it is possible, after having measured the skin previously, to reach the deep layers with accuracy. The Tuberculin Committee of the Medical Research Council was responsible for carrying out the first tests on the double intradermal method of tuberculin testing, and they reported favourably on the method.* The following conclusions were arrived at by the Tuberculin Committee :—

" (1) The double intradermal test is found to be a reliable test for the detection of tuberculosis in cattle, and this view has been confirmed by the results of *post-mortem* examination of tested animals. For instance, out of 835 animals which had shown no reaction to the subcutaneous test, 122 reacted to the double intradermal test and 94 of these reactors proved tuberculous at autopsy. No autopsy was made on the remaining 28 animals. The test is regarded as simple, clean, and easily performed under farm conditions; its technique is easily acquired; it does not disturb the farm routine; it does not involve keeping the animals indoors; it has little or no effect upon the milk-yield; it may be applied to pregnant cows without risk, and to young animals even three to four months old or less.

(2) The vast majority of veterinary surgeons who have experience of the double intradermal test regard it as much more trustworthy in its results, and much easier to conduct, than the subcutaneous test.

(3) A certain percentage of doubtful reactions occur with the double intradermal test. After carefully examining

* Paper presented to the North Wales Division, N.V.M.A., at Corwen, on July 11th, 1930.

the evidence, the Committee consider that a number of cases have been regarded as 'doubtful' for one of the following reasons; either (*a*) the examining veterinary surgeon has laid too much stress upon the question of measurements of the skin fold of the resultant swelling and has paid insufficient attention to the deciding clinical factors, pain, heat, soft œdema, and tenderness at the site of inoculations; or (*b*) the alleged 'doubtful' cases have been in animals suffering from extensive or chronic advanced tuberculosis which would not react to any form of tuberculin test. In these latter animals it should be readily possible to detect the presence of tuberculosis by ordinary physical examination, and by examining the milk and discharges for tubercle bacilli. A third possible source of error is (*c*) that the injection of tuberculin may be made too superficially.

There remains beyond these, however, a small percentage of cases in which the reaction to the test may appear 'doubtful.'

The Committee suggest that these cases should be retested by the double intradermal method of using sterile concentrated broth injections as controls.

With a fuller knowledge of the double intradermal method and by adopting the precautions suggested, it is believed that the number of doubtful reactions to the test will become insignificant.

(4) The Committee consider it desirable for the present to retain measurements of the skin fold in the conduct of the test.

(5) From the evidence given, the Committee consider it of importance to retain the 'double' nature of the test, that is to say, to give two injections of tuberculin, a sensitizing dose and a subsequent dose, for the proper conduct of the test.

(6) The Committee suggest that an increased strength of tuberculin might be employed. This should be done not by increasing the bulk of the dose (0·1 c.c.) but by using a specially potent form of tuberculin.

(7) In order to obtain consistent results, the Committee advise that a standardised tuberculin be used in testing herds for graded milk-production.

(8) In the opinion of most veterinary surgeons the ophthalmic test is an unreliable test. The Committee suggest that its use in conjunction with the double intradermal test should no longer be prescribed and that the use of the ophthalmic test and other subsidiary tests in conjunction with the double intradermal test should be left to the discretion of the veterinary surgeon.

(9) The evidence reviewed would suggest that the double intradermal test may be applied at any time, and that it is comparatively little influenced by the previous application of other methods of testing. The Committee consider that further investigation is desirable on this point before a definite pronouncement can be made upon it.

"Advantages of the Double Intradermal Test over other Methods of Testing:—

"(1) It has frequently been stated that the double intradermal test has detected many cases of tuberculosis which had failed to react to the subcutaneous test, the result being verified by *post-mortem* examination.

(2) It does not interfere with the routine of farm work to any great extent.

(3) No temperature observations are required; this saves time and it rules out the difficulty which arises where an animal has a high temperature due to some other cause.

(4) The milk yield is interfered with to a very slight degree, if at all.

(5) Animals can be tested and turned out to grass.

(6) It does not upset pregnant animals whereas the subcutaneous test may do so.

(7) It is a reliable test even when repeated several times.

(8) 'Doping' by previous injections of tuberculin cannot be employed to nullify the test."

"Disadvantages of the Double Intradermal Test.

"(1) The difficulty sometimes experienced of interpreting doubtful reactors. Generally speaking, if one interprets doubtful reactors as positive cases one will prove to be right, but this can be verified by the inoculation of sterile concentrated glycerine broth as a control in comparing the swellings on re-testing.

(2) Septic contamination of the site of inoculation. This does not occur when ordinary care is adopted by a skilled practitioner.

(3) The technique of the test is more difficult than the subcutaneous method. This is admitted, but the technique can very soon be acquired with practice and the advantages of the method justify the expenditure of a little time and trouble by veterinary surgeons."

The Caudal Fold Site.

The double or single intradermal test may be performed in the folds of skin between the base of the tail and the anus. I find that it is a convenient site for use on animals which have thick rough skin on the side of the neck due to lice, mange mites or other parasites. It is also very useful for bulls which have thick skins. This site has the further advantage of not requiring to be clipped or shaved.

The test may be performed by drawing the loose skin to the side of the tail with the left hand, and injecting tuberculin by means of the dental syringe into the thin skin with the right hand, with the tail in its normal position; or an attendant may hold the tail in a line with the body or slightly raised and the injection is made in that position. The needle is introduced between the layers of skin which are practically in apposition and is then pressed towards the surface. As this is done tuberculin is introduced by pressure on the piston of the syringe.

I have found in intradermal tuberculin testing, and in testing animals with Johnin, that this is a very satisfactory site. Well-defined swellings, the size of a walnut or larger, frequently occur after one injection only, although I consider two injections enable the operator to obtain a higher degree of accuracy with the test.

Measurement of the skin is more difficult when using this site. It is the character of the swelling rather than the size which is the determining factor in reading the test. Any swelling larger than a pea must be considered doubtful and the same attention must be given to the character of the swelling, the tenderness, and œdema as in reading a reaction on the skin at the side of the neck.

In using this site, I think the operator has the advantage of the fact that, even if the injection is made between the two layers of skin, he will get a reaction in the great majority of cases, and it is almost impossible not to reach the deeper layers of the skin on account of its thinness in this region. Certainly there is a disadvantage in the fact

that the skin of the caudal fold is frequently soiled with fæces, but possibly there is a greater resistance to most organisms on this account. The main disadvantage of this position appears to be the fact that the operator is more likely to become soiled with fæces than when using the skin at the side of the neck for performing the test, and there is the liability of the operator being kicked whilst injecting the tuberculin. This can be overcome, however, by the use of a kicking strap.

Tuberculin.

It is quite useless to carry out diagnostic tests with tuberculin unless this laboratory product is reliable. In the past some tuberculin has been available which was not up to standard. One of the most essential points in testing cattle is that the tuberculin should be of standard potency, and it is to be hoped that before long it will be standardised in this country.

Tuberculin which is used for diagnostic purposes in cattle is commonly prepared by growing the tubercle bacillus on the surface of glycerine broth for several weeks in specially-constructed flasks with flat bottoms until there is a thick, wrinkled growth which spreads over the surface of the medium. The flasks are then sterilised by steam for two hours and filtered, and the liquid upon which the tubercle bacilli have grown is concentrated to the required concentration. Tuberculin for subcutaneous use is prepared in the same manner but is used dilute, or only slightly concentrated, and 0·5 per cent. carbolic acid is added as a preservative.

A Tuberculin Reaction.—A tuberculin reaction is the result of a hyper-sensitiveness on the part of a tuberculous animal to the growth products or poisons produced by the tubercle bacillus. This increased susceptibility is manifested by local inflammation at the site of injection, and frequently by a noticeable rise in temperature. In a healthy animal a dose of tuberculin, containing the growth products and essential substances of the tubercle bacilli, evokes no change from the normal.

Professor Buxton, in his popular lecture on the subject of Tuberculin Testing at last year's N.V.M.A. Congress, stressed the importance of standardisation of tuberculin. I consider this is all-important. The test stands or falls on the potency of the tuberculin, and as a profession we may stand or fall on the test, at least in certain directions. Until we have standardisation it is essential that the tuberculin which we use shall be obtained from a laboratory with a reputation for the production of only the best products.

I intend to continue this paper with the aid of lantern slides. In the first series you will see a number of animals which were reactors to the test and were spreaders of tuberculosis. The second series shows you a number of intradermal reactors in cattle and pigs and in a fowl.

As a matter of interest, I am showing you some slides relating to subcutaneous tuberculin reactions. The first two are temperature curves in healthy animals, the next is a suspicious reaction, and the others are curves produced by reactors.

The two slides which follow show positive ophthalmic reactions.

The next series consists of five slides on the preparation of tuberculin.

On account of the importance of the condition I am showing you four cases of tuberculosis of the udder in cows which should give a positive reaction to the intradermal test.

Then there are six slides representing tubercle bacilli in milk, and the remaining slides are of tuberculosis lesions which one commonly finds when making a *post-mortem* examination of animals which have reacted to the test.

Reference.

* Second report of the Tuberculin Committee on tuberclin tests in cattle, with special reference to the intradermal test.

Discussion.

Dr. R. F. Montgomerie, in response to the invitation of the President (Mr. J. H. Wynne) that he should open the discussion, said he agreed with the emphasis laid by Mr. Downham on the importance of having reliable tuberculin. He instanced a case where a practitioner had been sold tuberculin which was obviously not concentrated. Dr. Montgomerie appreciated the difficulty of reading the results of the tests which some practitioners experienced, but thought faulty technique in injecting was a serious hindrance. The injection was often not put in the correct position. In his opinion it was essential to put the tuberculin deeply, and it was immaterial whether some of it went beneath the skin. There were three signs which aided him in injecting—firstly, the tuberculin could be felt going in; secondly, there was a resistance to the piston, and thirdly, the animal flinched. If one was in doubt as to whether the injection was correctly performed it was advisable to give a second injection in the neck. This avoided having to put the needle into the same area a second time—a procedure which he found was unsatisfactory, as the tuberculin often ran out of the first hole.)

With regard to the reaction, he agreed with the essayist that measurements did not mean much to him; in fact, he would be more confident of his opinion if he had not to use calipers. He thought it best to make up one's mind by looking at the swelling and that first opinion was usually correct. The presence of heat did not, in the speaker's opinion, denote a positive reaction, but at the same time he did not say that the absence of heat indicated a negative reaction. The important matter was the nature of the swelling, *i.e.*, whether it was diffuse or localised. He thought he might describe the negative swelling as being peaked. It was curious that Joseph, who advocated the test 20 years ago, recommended that the injection be made near the surface of the skin, whilst to-day it was advised that the injection be made deep. He, Dr. Montgomerie, had noticed, particularly in negative reactors, that a small slough appeared sometimes at the site of injection. Possibly this was due to his injection being too superficial. He would like to ask Mr. Downham what he would regard as the shortest interval which should elapse between a test and a retest. Also what were his views regarding shaving and clipping the hair. Mr. Downham had spoken of "doubtful reactions." What was a doubtful reaction? With regard to the caudal fold injection, he thought it a pity that the caudal fold site was not permitted in this country as it was in America. He would like to know what dose Mr. Downham recommended for use in this site.

These were points of major importance which he had noticed in reading over the paper. He was glad of the opportunity of hearing Mr. Downham and he thanked him for his excellent paper.

Mr. H. T. Matthews, who followed, said that Mr. Montgomerie had voiced most of his difficulties in connection with this test. He used to rely upon the increase in the skin being diagnostic, but apparently this was not so and he would have to rely upon his own judgment. He thought the subcutaneous method difficult to improve upon. The injection was made, the temperatures taken, and the result was evident. In the intradermal method he found considerable difficulty in dealing with nervous cattle. Some it was almost impossible to hold, and some were so sensitive

that it was very difficult to decide whether the swelling was painful.

Mr. J. D. Broome wished to ask Mr. Downham if he had followed Professor Vallée's work on the caudal fold site, and what was his opinion of it.

Mr. G. J. Roberts stated that it was apparently still a matter of opinion as to which was the best test. He had, however, tested his own herd by the intradermal method after having previously eliminated reactors to the subcutaneous test, and out of 18 cattle 6 had reacted to the intradermal test. This was three months after the last subcutaneous test. With regard to the actual injection, he found that if the neck of the animal was pressed upon whilst injecting there was less likelihood of the animal plunging. The amount of tuberculin used was not important, even ·4 c.c. would not be too much. He used to clip a small area but after seeing a demonstration by Mr. Downham where he showed œdema and inflammation of the lymphatics running from the base of the swelling, he now clipped a much larger area. He considered it essential to feel the pea-like nodule due to the presence of the tuberculin after injecting.

Professor Share-Jones said he had watched for some years now the changes of opinion regarding the various methods of testing—subcutaneous, ophthalmic, intradermal, etc.—and he wondered how much further they had got in this period. Were they progressing at all in the solution of the problem of the elimination of tuberculosis? Whilst the method of testing was important, he thought a more important matter was the standardisation of tuberculin—as indeed of any similar biological product—and the control of its use. There was only one person who should be entitled to use tuberculin and he was the qualified veterinary surgeon. At present anyone could use it and no complete statistics concerning its value were available. He had seen it stated by a particular investigator that in the human subject 90 per cent. of all *post-mortem* examinations revealed some form of tuberculosis. Such information as this was denied to the veterinary surgeon since there were no systematic *post-mortem* examinations. There was only one solution of the problem and that was to bring the animals under the purview of those whose profession was intended and designed to deal with them. This would be possible if a national and compulsory system of live-stock insurance were instituted. Such a measure was long overdue and he hoped to urge its importance at the forthcoming International Congress.

Mr. J. E. Mills spoke of his experience of the caudal fold site, which he recommended. He had, fortunately, been able to perform his early tests on quiet animals. He could not agree with Mr. Downham that the temperature of the animal at the time of injection was of no consequence. It might be, he thought.

Mr. J. Cane thanked the essayist for much valuable information. He was practising the test on quiet cows, but he still felt more confident with the subcutaneous test. In testing in the caudal fold he had often noticed a large swelling develop in half-an-hour after. He wondered if there was any significance attached to this.

Mr. Gordon (a visitor) thought the difficulty of getting the tuberculin in the right spot could be overcome by using a short needle.

Mr. Wynne Lloyd said that the two reasons which caused him to favour the intradermal method of testing were firstly, because it was easy, and secondly, it did not interfere with one's night's rest. He recalled how Mr. Cartwright had demonstrated some time ago the effects on his arm of an infection following an operation on a tuberculous cow. Since then he himself had injured himself when using a hypodermic needle on an unruly cow. The animal plunged and the needle entered his finger. In about three hours the finger became swollen and very painful and the trouble soon spread up the arm. The condition troubled him for three or four weeks, the tip of the finger being still painful and becoming darker. Finally, a large area sloughed away and at last recovery occurred.

Mr. F. Booth considered the test a valuable diagnostic. He had used it for four years and now felt himself sufficiently experienced to read the results of the reactions correctly. He always made a point of finding the pea-like swelling at the site of injection.

Mr. R. Platt (a visitor) said that he also confined himself now to the intradermal method.

Mr. Evans (a visitor) asked if Mr. Downham had ever had any symptoms in the udder as a reaction. In three cows which he had tested he had found a definite œdema occurring in the udder as a result, he considered, of the injection.

Mr. H. Williams observed that he had been testing in this way for three years. It was essential, he thought, to inject deeply. In reading the results he considered that if one could decide whether the swelling was hard or soft, and localised or diffuse, one was then able to say whether the reaction was positive or negative. He made it a practice to clean the area before injecting and he used surgical spirit for the purpose.

Mr. W. H. Savage was doubtful whether the intradermal test was superior to the subcutaneous method. In his district he thought possibly the animals were more than usually difficult to deal with and he was not always confident that he had injected the tuberculin into the correct depth of skin. He asked Mr. Downham how many doubtful reactors there were among the six animals brought to the meeting and, on being told that there were two, he expressed himself unable to commend the intradermal method. He wished to ask Mr. Downham if he thought it possible for an owner, if he so desired, to rub away an œdematous swelling.

Dr. T. W. Wade (a visitor) said that when he received the Secretary's letter inviting him to attend the meeting he decided at once to accept the invitation. His department had issued 49 licences for Grade A or Certified milk during the last 12 months and as many of the veterinary surgeons present were responsible for the testing of the cattle in these herds he was glad of the opportunity to meet them. Dr. Wade then went on to discuss the types of report which were being received and pointed out the variety of opinions expressed in the interpretation of the results of the intradermal test. Differences were bound to arise, but he thought that demonstrations such as had been arranged that afternoon would go far to clear up any doubtful points.

The Reply.

Mr. Downham, in replying, said he was glad that the speakers had agreed that the tuberculin used in this test should be of standard potency.

Proceeding, the essayist said: In reply to the opener, Dr. Montgomerie, the amount of tuberculin for the intradermal test is 0·1 c.c. Tuberculin sent out by the Pasteur Institute and marked one dose for intradermal use varies in quantity, sometimes I have found nearly 1 c.c. in the ampoules, this amount is difficult to inject intradermally. It is possible to obtain a good reaction with less than 0·1 c.c. of concentrated tuberculin. It is important that the injection be made in the deep layers of the skin. I have not found animals always flinch when the tuberculin enters the skin; it is so, in most cases. I consider the caudal fold a very satisfactory site. It is useful as a confirmatory test with the double intradermal test in the skin of the neck, and is particularly useful in animals with rough, thick skins, due to lice or other parasites, and also in testing bulls. In these animals it is a good thing to repeat the test in the caudal fold if only for one's own satisfaction in arriving at a decision. If two attempts have been made in the same area of skin and tuberculin comes to the surface through the first needle track when injecting the tuberculin, it is possible that the test has been performed too superficially.

I agree with Dr. Montgomerie's remarks about heat, I do not think heat is a constant factor in all positive cases at the time when the reactions are examined. Heat is present in a certain proportion of positive reactions. Dr. Montgomerie spoke of a peak in describing a negative reaction. It is difficult to describe the condition to which I think he refers. Sometimes one gets a negative reaction which is quite hard and insensitive, which appears as if a small pea had been inserted in the skin. I think this occurs where a large dose has been injected somewhat

superficially. The surface slough is also more likely to occur if the operator has injected into the outer layer of the skin. With reference to Joseph's tests, I think Dr. Montgomerie agrees that it is impossible to perform the test except in a superficial manner; when using the intradermal test in the caudal fold, the double thickness is frequently only 4 m.m. in this site.

I agree that the character of the swelling is of first importance and the test depends upon the skill and careful observations of the operator. I think measurement is of value in some cases.

Dr. Montgomerie asked why the subcutaneous method and temperature recording has been superseded. I imagine the answer to that question is that the intradermal method has been found to be more accurate under ordinary conditions when it is generally applied and on account of the method not causing desensitization when frequently applied to cattle. It is more difficult to feel the tuberculin in the skin of a bull where the measurement of the skin fold is 15 m.m. or so. A longer needle may be necessary for injecting such an animal and the caudal fold should be used as well as the skin of the neck. I do not give a second injection in the caudal fold if the first injection on the side of the neck has given a positive reaction. A retest can be performed a few days after the first test. It is advisable to leave it longer if this is practicable. I prefer clipping the hair to shaving as there is less likelihood of scratching or abrasing the skin.

I use rather more tuberculin when performing the test in the caudal fold than in the skin on the neck, usually 0·2 c.c. I should consider a reaction to be doubtful when there was a swelling about twice the size of the initial measurement, with smooth edges and very slight tenderness after prolonged manipulation. In my experience, if doubtful reactions are considered positive one is more likely to be correct.

I hope I have answered all the points raised by Dr. Montgomerie and thank him for letting me down so lightly.

Dr. Wade has emphasised that this is a new test and in its performance there is bound to be a little difficulty at first. With experience, the difficulties are lessened and the number of " doubtful " reactors becomes less.

I consider that co-operation between the medical and veterinary professions is essential in dealing with the problem of tuberculosis.

In reply to Mr. Matthews, there is a difficulty in performing the test on some nervous animals. I have found white cattle are often very sensitive, and occasionally I have had to throw the animal before applying the test. I consider the caudal fold has an advantage here; animals often appear to be less sensitive to the needle when the test is performed in this region. Where an animal is so sensitive that there is a difficulty in deciding about the tenderness of a swelling, it becomes necessary to rely upon the character of the reaction. If it is diffuse and œdematous there is no doubt the animal is tuberculous.

Mr. Mills found a difficulty in detecting heat in some of his reactors. I sympathise with him and do not think it is always present. With regard to the temperature at the time of injection, I think I said the test could be performed irrespective of the temperature of the animal within reasonable limits. I should not advise testing an animal with a temperature which was obviously very high.

In reply to Mr. Broome, I have not seen a record of Vallée's work on intradermal testing in the caudal fold site.

Professor Share-Jones considers that tuberculin should be of standard potency. I agree with him that the person to test animals must be a veterinarian, and the veterinary profession should have a large share in the standardisation of tuberculin, and should control its use in animals. I believe over 90 per cent. of *post-mortem* examinations on human beings show evidence of some small lesion of tuberculosis. No temperature records are necessary in this test. A temperature does occur in a certain proportion of cases at about the sixth hour after injection.

Mr. Cane asked if it is common to get a swelling an hour or so after injection which passes away again. I have found this to be the case.

Mr. Savage doubts whether the intradermal test is better than the subcutaneous. I hold that under general conditions found on a farm the intradermal is the better test to use. With regard to the fact that two animals had not given very definite reactions out of the seven which were here for demonstration, it must be remembered that these animals were in an advanced stage of the disease and would probably not give a definite reaction to tuberculin in whatever way it was applied. The veterinary surgeon applying the test must consider the condition of the animal. It is not yet 72 hours after the initial test; the swellings will probably be more definite at that time.

I am quite sure it would not be possible for an owner to rub away an œdematous swelling.

In reply to Mr. Evans, I have not noticed œdema of the udder to occur as the result of the intradermal test. I think it is probable that tuberculin does occasionally cause a local reaction in the neighbourhood of a tuberculous lesion. I have noticed some animals occasionally to be affected by the test and to show a rise in temperature and diarrhœa, but this is only in a very small percentage of reactors.

Reliability of the Tuberculin Test.*

By John R. Mohler, Chief of Bureau of Animal Industry, U.S. Department of Agriculture.

There has been so much material written and distributed on this subject during the last few years that I hesitate to approach it, knowing that there is very little new to present in addition to what I have already stated on numerous occasions.

A review of this literature, and a careful study of the developments in connection with the control and eradication of tuberculosis among live-stock, cannot help but convince any fair-minded person that the tuberculin test as used in the tuberculosis campaign has been a most reliable and helpful agency. There is no question but what the use of tuberculin has been a most important factor in this activity.

The bureau of animal industry of the United States Department of Agriculture primarily began the studies of the action of tuberculin soon after it was discovered by Robert Koch of Germany in 1890. In fact, the bureau of animal industry began the manufacture of tuberculin in 1893, and the laboratories of the bureau have been producing this product ever since. During the last 10 years great quantities of tuberculin have been necessary for use in the co-operative campaign, making it especially important to have an adequate and reliable supply of tuberculin available at all times. This has been prepared by the bureau, or under government or state supervision.

Nature of Tuberculin.

Tuberculin, which is prepared by sterilising, filtering, and concentrating the liquid upon which the tubercle bacilli have been allowed to vegetate, contains no tubercle bacilli, either living or dead. The very nature of the process of the manufacture of tuberculin precludes any possibility of contamination with living or dead tubercle bacilli. The product contains no substance that has any detrimental effect upon a non-tuberculous animal. It does, however, cause what is known as a reaction in tuberculous animals,

* Reproduced from *The North American Veterinarian*, June, 1930. No. 6, Vol. XI.

making it of great value in the detection of tuberculosis in the living animal. Quantities of tuberculin, much larger than those ordinarily used in connection with the diagnosis of tuberculosis, have been injected into cattle by numerous investigators, who have found that it has no detrimental effect whatsoever on healthy animals.

Although tuberculin has been in use for testing cattle for nearly 40 years, and although in this country it is used annually to test more than 10,000,000 cattle for tuberculosis, very few have much conception of what the product really is. The average idea probably is that it is some kind of product derived from tuberculosis germs and therefore that it must of necessity be more or less dangerous or harmful. Despite this erroneous supposition the fact remains, of course, that tuberculin is essentially the clear, sterile, culture filtrate obtained from the growth of tubercle bacilli on a beef broth medium. This broth is essentially nothing but a meat extract, a consommé to which salt and glycerine are added. The tuberculin which we use for test therefore consists of such parts of the broth and glycerine as the germ has not used in making its growth. In addition, the tuberculin contains a small amount of the material derived from the growth of the germs but never the germs themselves.

Many bacteria produce toxins when they are grown artificially on broth in laboratories. These toxins are capable in certain cases (lockjaw, for example), of causing symptoms of the disease for which the germ itself is responsible. In the case of tuberculin, however, it is very different. The tuberculosis germ when it grows does not produce any substance which can be called a toxin or poison. The culture filtrates, or tuberculin, are entirely without effect in any reasonably conceivable dose when applied to healthy animals. Not even a suggestion of the lesions or symptoms of tuberculosis can be induced in healthy susceptible animals by the injection of tuberculin.

Perhaps the fear that healthy cattle may be in some way injured by testing with tuberculin is based on the misconception that tuberculin is poisonous. I have just explained that that is not true. However, it is true that animals which are tuberculous are affected by tuberculin injections. This specific sensitiveness is such that tuberculous guinea-pigs may actually be killed by tuberculin injections in doses which have no effect whatever on healthy guinea-pigs. This reaction, of course, is due to the fact that the tuberculous animal is overly sensitive (hypersensitive). The tuberculous animal is very much like the man who is subject to hay fever. The pollens of the rag weed and other plants may cause a tremendous reaction in the susceptible hay fever patient, whereas for the ordinary normal person such weeds are entirely harmless. It is an analogous condition that exists in connection with tuberculosis and tuberculin. The tuberculous subject is extremely sensitive, whereas the normal individual is affected not at all.

Efficiency as a Diagnostic Agent.

You are all familiar with the remarkable progress that has been made in the eradication of animal tuberculosis in this country during the last 12 years in which the co-operative campaign has been in progress. Almost 2,000,000 tuberculous cattle have been removed from the herds in this country as a result of their detection by tuberculin. More than 180,000 herds containing 2,500,000 cattle in the United States are now on the fully accredited herd list, and there are more than 2,000,000 additional herds containing 20,000,000 cattle that have passed one successful tuberculin test. Herds heavily infected with tuberculosis have been freed from the disease in a few years by continued tuberculin testing and the enforcement of proper sanitary measures.

The diagnostic powers of tuberculin are really remarkable when one considers the difficulty that surrounds the detection of many diseases in the living animal. The systematic tuberculin testing of cattle has made it possible to eradicate bovine tuberculosis from large areas in this country. To-day there are more than 900 counties, including two entire states, in what is known as the modified accredited area, meaning that the degree of infection of bovine tuberculosis does not exceed one-half of one per cent. of all the cattle contained with such areas. Within a very short time all the counties in a third state will be placed in the modified accredited area.

Other evidence of the effectiveness of tuberculosis eradication, based upon the tuberculin test, can be obtained from the records of the federal meat inspection service. This service, as you know, covers the *post-mortem* examination of approximately 10,000,000 cattle and 47,000,000 swine each year. There has been a very marked reduction in the amount of tuberculosis found among cattle and swine slaughtered under inspection in the last few years. Additional information on the reliability of the tuberculin test will be found in our miscellaneous publication No. 59, issued in October, 1929.

Concerning Some of the Criticisms.

One of the frequently used statements of the critics and opponents of the tuberculin test is that it does not detect the badly diseased cow. This is not so except in a small proportion of cases. Retests in herds occasionally disclose advanced cases that did not respond to a previous test. However, physical examination and retesting locates these advanced cases that are occasionally missed.

On the other hand, it is a fact that approximately 10 per cent. of all cattle that react to a tuberculin test in connection with the co-operative campaign have been found to be well marked and advanced cases of bovine tuberculosis. This distinctly shows that tuberculin does detect the badly infected tuberculous animal. Of course, as the campaign progresses the old chronic, advanced cases are being eliminated and the percentage of carcasses going to the fertilizer tank is being greatly reduced. Again, it is stated at times by critics that tuberculin causes the condemnation of the best cows in the herd. It is probably true that many of you have seen some outstanding animals react to a tuberculin test, but in gathering statistics on this subject the bureau found that about 33 per cent. of a group of reactors numbering approximately 17,000 head were considered to be below the average in quality. It was also found that about 25 per cent. were above the average in quality. These records were obtained chiefly on cattle of the dairy type. Of course, you hear a great deal about these 25 per cent. but never a word from our critics about the 33 per cent. of reactors below average.

One absolutely erroneous criticism totally unsupported by the facts and manifestly a figment of the imagination that lacks also the background of good horse sense, refers to the appearance of the injected tuberculin in milk following

the testing of cows for tuberculosis. As a result of consuming milk from tested cows it is alleged that babies are made seriously ill and men suffer from rheumatism, heart disease, and even sterility. Such a suggestion to anyone who is informed on this subject, is so fantastic as hardly to require discussion. Consider for a moment the amount of tuberculin injected into a cow when she is tested. The dose certainly does not ordinarily exceed 2 or 3 drops (1-10 of a cubic centimeter). Careful laboratory experiments have shown that this amount of tuberculin does not contain more than 1-500 of a grain of total material which may arise from the growth of the tubercle bacillus. So far as I am aware, even the most toxic substances known to us are without any effect in a dose of 1-500 of a grain, so that even if this entire amount of tuberculin were placed in one glass of milk, we could not conceive of any effect upon the person who drinks it. But we have no such condition in tuberculin testing. This minute amount of material is injected into the skin. It is certainly absorbed very slowly, requiring as a rule more than 48 hours to produce a reaction, and there is nothing whatever to indicate that any of it ever reaches the milk supply. If it did, you can readily understand that the amount would be so extremely minute that the health of the consumer could not possibly be affected, even though tuberculin were a virulent poison. I have already stated, however, that tuberculin is not poisonous, but when given to normal guinea-pigs by injection or otherwise, in doses 28,000 times greater in proportion to weight that those used for testing cattle, it is without any observable effect whatever.

Returning to the question of toxicity, it can be maintained and proved beyond question that tuberculin, weight for weight, is nothing like as poisonous as common table salt.

However, in order to obtain definite experimental evidence relative to the possible appearance of tuberculin in milk from tested cows we conducted the following investigations: It is well known how susceptible milk is to taking up the flavour of garlic when cattle are turned on pasture in the spring. We have found that within half an hour after a cow was fed a small quantity of garlic, the flavour and odour of garlic were readily perceptible in the milk. However, when 30 c.c. of undiluted juice from garlic stems (300 times the intradermic dose of tuberculin) were injected under the skin of cows, no taste or odour of garlic could be detected in any of the milk samples which were taken from the udders at one to three hour intervals over a period of three days.

With the view of studying this subject further a highly distinctive aniline dye (methylene blue) was also injected into the tissues of a series of additional cows. A blue solution 40 times the intradermic dose of tuberculin was used. As in the case of the garlic injections, none of the milk samples examined over a two-day period showed any evidence of abnormal colour.

Additional tests were made with samples of milk from cows which were injected with 30 times the average dose of tuberculin. Milk was drawn from their udders at the two regular milking periods after their injection and 5 cubic centimetres inserted into the abdominal cavities of each of a number of tuberculous guinea-pigs known as group A. Other tuberculous guinea-pigs of group B were injected intra-abdominally as controls with the same quantity of untested cows' milk and a series of tuberculous guinea-pigs of group C with the usual dose of tuberculin only. The results were clean cut and decisive. All guinea-pigs of group C injected with straight tuberculin either died within 48 hours or developed marked depression with high temperatures. Those of group B receiving the milk from untested cows remained normal and likewise the guinea-pigs of group A which received milk from recently tuberculin tested cows never missed a meal nor developed any visible abnormal conditions whatever. The experiment is considered to be a very sensitive one and had there been any tuberculin in the tested cows' milk, it certainly would have been noted in such overly sensitive animals as tuberculous guinea-pigs are known to be when injected with minute quantities of tuberculin. On the other hand, I wish to take this occasion to challenge any of our critics to produce a single experiment from an authorized source which would show that the injection of two drops of tuberculin (our customary dose) or even four c.c. (rarely used) could result in the elimination of this product in the milk. Furthermore, there is not a reputable medical or veterinary college in this country or a recognized authority on tuberculosis in the United States who does not teach that bovine tuberculosis is transmissible to our children and whether the percentage is 5 or 45 becomes very immaterial when we discover that your children or my children are being exposed to the disease by drinking infected milk.

Still another frequently heard criticism of some no doubt well-intentioned but misinformed individuals is that the tuberculin test is the cause of contagious abortion among cattle. This statement can not be substantiated by any line of reasoning or by unbiased observation. Unfortunately contagious abortion among cattle is a rather widespread disease in the United States at this time. Naturally, any disturbance in the health of a herd of cattle that may follow the tuberculin testing will be attributed to the test by those not in favour of it.

At one of the hearings a few years ago Congressman L. J. Dickinson requested me to answer the question "Does the tuberculin testing of cattle cause the spread of contagious abortion among the tested cattle?"

I was very glad to be able to answer Congressman Dickinson with a statement to the effect that there was absolutely no evidence to indicate that such was the case. In fact, I referred him to two large and valuable herds of cattle not far from the United States capitol which have been tuberculin tested semi-annually for years, and in which neither tuberculosis nor contagious abortion exists. This can be truthfully stated in regard to many other valuable herds of cattle located in all parts of the United States. With the widespread and very extensive activity in connection with the tuberculin testing of cattle in area work, we have had the opportunity of making considerable observations in this connection. I therefore wish to make the unequivocal statement that abortion disease has not been spread by the use of tuberculin or by the application of any of the methods used to control and eradicate bovine tuberculosis.

Alleged Impurities of Tuberculin.

You may have heard statements to the effect that tuberculin contains impurities which render it harmful. The efforts of laboratory workers to separate, in perfectly pure

condition, the minute amount of material in tuberculin which causes the reaction have led some, in discussing such work, to refer to impurities in tuberculin. It should be remembered that impurities from the standpoint of a chemist and from that of an ordinary non-scientific individual, are very different things. To the chemist any substance in tuberculin other than the actual precise substance which causes the reaction, would be an impurity. To the ordinary man, however, impurity implies something that reduces the effectiveness of the active material or which actually imparts to the product undesirable or dangerous qualities. Tuberculin, as produced by the bureau of animal industry, contains no impurities when considered from the latter standpoint. It does, however, contain a certain amount of material which is not apparently active in producing the reaction. That inactive material consists of salt, or glycerine, and of any unused portions of the beef extract. The greatest care is taken by producing laboratories to see that tuberculin is pure in the sense that it will produce no effect on normal animals. In our laboratories a large force of trained men is employed, and no tuberculin is ever shipped until it has been subjected to exacting tests for purity.

Concerning Reactors that do not show Visible Lesions of Tuberculosis.

It is only natural that some animals responding to this delicate test do not contain lesions of tuberculosis that can be seen under normal conditions. Tuberculosis does not develop spontaneously upon exposure, but the disease develops slowly up to a certain stage, depending, of course, upon the amount of infection introduced into the animal, as well as the virulence of the organisms, and the susceptibility of the individual. During the time when the disease is in the process of development in cattle a reaction will result upon the application of a tuberculin test. An animal that reacts under these conditions is very likely to show no visible lesions upon autopsy, even though the most careful technic is followed.

Further, it may be stated in this connection that in a great majority of the cases of cattle that react to the tuberculin test the lesions are slight, often times being confined to one location. Tuberculosis is found in very many different parts of the animal body, including many remote places that may be overlooked upon ordinary *post-mortem* examination. Microscopic examination of numerous specimens examined in laboratories throughout the country has indicated the presence of tuberculosis invisible to the naked eye.

Retesting Reactors.

Livestock sanitary officials have sometimes been criticised because of their attitude on appeals concerning the classification of cattle that have given a positive reaction to tuberculin. These criticisms, when honestly made, are based on a lack of information on the part of the individuals from whom they originate, who fail to give due consideration to the fact that a highly scientific test is involved. Rules of arbitration or court technicalities cannot limit or affect the result any more than they could affect the action of the planet upon which we live.

The fact that an animal may react only once in a long period of time was definitely decided many years ago. Some years ago the bureau caused to be retested 343 reactors, with the result that 129, or 38 per cent., did not react, 21 of which were generalized cases, and had they been returned to the herds from which they had been removed serious results surely would have followed.

Please do not understand me as asserting that a veterinarian cannot make a mistake. He is only human and should be regarded only as such. However, it is known that they are most efficient in their aptness in administering the tuberculin test, which fact is established beyond any doubt by a check of the *post-mortem* reports covering the slaughter of thousands of reacting animals.

The result of the application of the tuberculin test to a herd of cattle does not show to what extent the reactors are diseased, but in the operation of any plan that will be successful in the control and eradication of an infectious disease such as tuberculosis, slightly infected animals can not be left in the herd with safety. This fact makes the operation of the campaign an expensive one. It is not surprising that the people of this country hesitated for many years before launching upon a strenuous and nation-wide campaign to stamp out this animal disease.

Now that the campaign has developed to its present stage livestock owners are determined to complete the task. Results everywhere apparent clearly indicate a very hopeful outlook for it, although we must all be prepared to meet reverses and consistently follow the most approved methods in its control and eradication.

With these few remarks, I would like to say in closing that the tuberculin test has stood the test of time. Forty years have elapsed since this product was discovered. It is universally used in the diagnosis of tuberculosis, and as time goes on, those who are continually observing what is accomplished by its use have more confidence than ever in its dependability. Without this product and its proper application we would not be in a position to offer encouragement in the control and eradication of a disease that had made such inroads upon the livestock of our country before definite and effective plans were perfected for its control and extermination. Furthermore, the confidence which cattle owners have shown in this test is apparent from the fact that we have never been able to keep up with their requests and at the present time over two million cattle are on a waiting list to be tuberculin tested.

Transit of Animals (Amendment) Order of 1930.

For some months past the Ministry of Agriculture has been considering the conditions under which animals are transported in road vehicles throughout the country, and particularly the question as to whether any amendment of the Order of 1927 is necessary to meet these conditions. The Ministry has been impressed by the increased use of motor vehicles for the carriage of animals, and is of the opinion that the time has come for the revision of the Regulations governing the cleansing and disinfection of road vehicles generally, and also for the regulation in certain respects of the construction of motor vehicles used for animals, with the view of preventing unnecessary suffering of such animals in transit. The decision of the Ministry in these matters has been embodied in a new Order entitled the Transit of Animals (Amendment) Order of 1930, which will come into operation on the October 1st, 1930, except Article 5 (Construction of Vehicles), which will not take effect until October 1st, 1931. This will give owners of vehicles a reasonable period of time in which to make their property comply with the new requirements.

The Veterinary Record.

September 13th, 1930.

The Tuberculin Test.

The past ten years have witnessed a significant increase in the demand for tuberculin testing amongst the herds in this country; moreover, during the same period, the introduction of the double intradermal test has led to a considerable modification in the attitude of the profession towards the relative precision of the various methods.

In the tuberculin test we possess a method of diagnosis which, provided it is applied with skill and interpreted with care, is capable of attaining a marked degree of accuracy. In the past the subcutaneous method has proved of inestimable value in the elimination of tuberculosis from infected herds, but a considerable volume of evidence is accumulating to show that it is not wholly reliable in the graded herds. The repeated subcutaneous inoculation of tuberculin at regular six monthly intervals appears to lead to a desensitisation of a proportion of affected animals so that they no longer react to the test, and several examples of the false security which has been engendered through a failure to realise these shortcomings, have been reported. Until these facts had been elucidated, no blame could be attached to those veterinary surgeons who had been responsible for the testing of herds in which many reactors were revealed by subsequent double intradermal tests. It may be within the knowledge of many of our readers that, in view of these anomalous results, the Ministry of Health are contemplating the substitution of the double intradermal for the subcutaneous test in the graded herds.

The articles on tuberculin testing which we publish in this issue are, therefore, particularly opportune, for they serve to draw attention to some of the difficulties which have arisen in the interpretation of the test and indicate how they may be overcome. It is evident that the double intradermal method is being increasingly used by veterinary surgeons throughout the country who find in it an accurate test which lessens interference with the routine of their clients. On the other hand, there are some who have experienced dissatisfaction chiefly on account of the doubtful reaction. This is a real difficulty with which we sympathise fully, but it is evidently the opinion of the writers of these papers that in the doubtful reaction we can detect signs of leniency on the part of the operator, and that many of the alleged doubtful reactions ought to be regarded as positive reactions. At the present moment, when there is an increasing demand for supplies of tubercle-free milk, a great responsibility rests upon those practitioners who apply tuberculin tests to the graded herds, and we feel that, in their interests, no effort should be spared towards the selection of the most perfect means of detecting tuberculosis in all its forms and under varying circumstances.

We would refer again to the desirability for some form of control over the manufacture and issue of tuberculin for veterinary use in order to ensure to the profession a product of adequate potency. It is courting failure to use a tuberculin of low value, but, in spite of this, there is no guarantee in this country that a given sample will prove reliable. This point is particularly stressed by Dr. Mohler, the distinguished Chief of the Bureau of Animal Industry, U.S.A., in a paper which is also reprinted in the current number. Many years ago, our American colleagues were convinced that, if their schemes for eradication of bovine tuberculosis were to be brought to fruition, the formulation of measures for the control of tuberculin was essential. In consequence, only tuberculin conforming to a certain standard, produced by the Bureau itself, or under government or state supervision, has been authorised for the official tests. The N.V.M.A. have urged the necessity for the standardisation of the product in this country: unfortunately, their efforts have not yet met with success.

R.C.V.S. Obituary.

Chambers, H. L., Downshire Arms Hotel, Banbridge, Co. Down. Graduated Glasgow, December 23rd, 1892; died July 13th, 1930.

Pottie, James Elder, Albert Villa, Nairn. Graduated Glasgow, May 25th, 1894; died August 30th, 1930, aged 59.

Death.—Sept. 4th, at 18, Stewart Terrace, Bearsden, Glasgow, Dorothy Alice, wife of Capt. J. Fox, M.C., M.R.C.V.S.

The *Meat Trades Journal* reports the death, at the early age of 39, of Mr. George G. King, for 20 years in the employ of the Corporation of the City of London as Meat Inspector on the Market. He was a son of Mr. King, M.R.C.V.S., for many years Superintendent of Islington Cattle Market. Among those present at the interment to pay their last tribute of respect were Lieut.-Col. T. Dunlop Young and all the members of the Inspector's staff.

Clinical and Case Reports.

Hyperpyrexia in a Foal.

By W. E. Blackwell, M.R.C.V.S., Towcester.

At the end of July this year, I was called to attend a foal. It was in excellent condition, four months old, and a filly, heavy draught. She had never ailed at all. The owner had insured both mare and foal, because he had never reared a foal before on this farm, a period of 16 years. Only recently I attended a foal with navel ill or another farm and the owner told me exactly the same story.

History.—The foal was first noticed this morning, July 31st. She was uneasy, not grazing, and evidently pre occupied. The weather had been unsettled and sunless, for about three weeks, in accordance with the edict of St. Swithin.

Symptoms.—The only symptoms observable were slight uneasiness and accelerated breathing. The visible mucous membranes were moist and normal in colour, and the mouth was the same as one sees it in perfect health. There were no discharges, no pain, and no sweating. What more than anything else led me to a correct diagnosis was this—an exceedingly high temperature, and a slight oozing of muddy liquid from the anus. It was only slight, certainly, but having made many errors of diagnosis, I paid much attention to this symptom.

Diagnosis.—Acute enteritis. The temperature was so alarmingly high—108°—that I said at once that the case would probably end quickly and fatally. This set me furiously to think, and I asked many more questions. Finally, I advised the owner to take a walk round his fields where the foal had been grazing, and look particularly near a brook or ditch, where poisonous plants are often found at this time, and where the hoof marks of the foal could be clearly identified.

Treatment.—A good dose of castor oil, with a stimulant. Foal to be kept under close observation. I left stimulants to be given in warm gruel every two hours to expedite, if possible, the action of the purgative.

Course of the Illness.—At noon, two hours later, pain had become manifest, and from now on, the paroxysms were very frequent and severe, until death ended the awful suffering at five p.m.

Result of Search.—I went over again at six p.m. to tell the owner not to send the carcass away, as it was insured. He was out, unfortunately, so I did not proceed. His wife brought me some plants which he had found by the brook. It was very clear to me that the foal had been eating these, and when I saw him next morning he explained to me how he found them, and the unmistakable evidence there was that the filly had been there. The plants were nibbled, beyond any reasonable doubt, and I sent one specimen to Professor Wooldridge. I told my client that I thought the plant was bittersweet, because I had some years previously traced the cause of death in a young horse to this plant, and bryony, which happened in the same locality.

Post-mortem.—Intense gastro-enteritis, especially in the large colon. The liver was in a state of fatty infiltration along its margin, but this was only to be expected in a foal in such condition, and was therefore of no importance. Everything else was quite normal. The stomach was nearly full, and to my great satisfaction the owner detected pieces of the plant in the stomach contents.

Remarks.—A few days later Professor Wooldridge replied "Yes, you are right, bittersweet" (*Solanum dulcamara.*) There is no need for me to mention the obvious, but our teachers are always ready and willing to help us with their great knowledge and advice, and it is this spontaneous help and encouragement which makes it worth the while to collect these interesting facts and record them, for the benefit of others. This kindly spirit is a source of inspiration to me, and the trouble required to take notes, make careful observations, collate and distribute them is thus worth the taking.

It may seem strange that a foal four months old, grazing in a field where the keep was so plentiful, should go out of its way to find and partake of poisonous plants. One could not be surprised at this if the pastures were bare and scorched. Nevertheless, it is a fact. They are naturally playful, mischievous, and inclined to nibble at anything. Later in life their powers of inherent discrimination grow and develop, and they leave such things alone, as a rule.

All this is known to the experienced practitioner, but, bearing in mind my own state of wisdom when I qualified, I do feel that the young graduate will read, mark, learn, and digest, imperfect, though very important, records such as this, so that he may the better serve. I had a pre-college pupilage with one of the most experienced and intelligent practitioners in our profession, and I quite understand the feelings of those fledglings who set out with high resolutions, but secretly realise the vast stretch before them, and the glorious imperfection of their own intellectual equipment.

We know in part. It is the failure to recognise our own limitations which hinders our professional, material, and spiritual advancement.

Interesting Series of Exhibits.

The following specimens were exhibited, and their histories given, by Mr. H. J. Loveless, M.R.C.V.S., of Ipswich, on the occasion of the meeting of the Eastern Counties Division, N.V.M.A., held at Cambridge, on July 25th, 1930.

Left Humerus of Suffolk Cart Mare.

History.—The mare was turned out into a meadow in the evening. During the night there was a sharp thunderstorm and in the morning the mare was found dead near a tree which had been damaged by lightning during the storm. On an area of about four inches of skin over the left humerus the hair was found to be singed. There was no signs of any struggling. *Post-mortem* examination revealed a comminuted fracture of the left humerus, the bone being in six pieces.

Bone Swallowed by a Bull Terrier.

A piece of cutlet bone 2½ inches long and four inches in circumference. This had been swallowed by a bull terrier puppy two months old. The puppy was seen four hours afterwards and was then in great distress. The bone was removed by opening up the œsophagus just anterior to the sternum. A very large opening was found

to be necessary before the bone could be removed. However, the puppy made a good recovery and in three weeks the wound had quite healed.

Ball Swallowed by an Alsatian.

Solid rubber ball, 7¼ inches in circumference and 3¾ ozs. in weight.

History.—The owner of an Alsatian dog 1½ years old, while attempting to get a photograph of it in the act of catching a ball, was surprised and alarmed to see the dog swallow the ball. He hurried with the dog to the infirmary where it was given apomorphine, one-tenth of a grain, intravenously. The dog vomited large quantities of food in four lots. These lots, however, did not contain the lost ball. The dog was then put into a kennel for the night and seemed quite comfortable. In the morning a large, hard, sharply-circumscribed swelling was detected a little anterior to the sternum. By gentle manipulation this swelling was moved gradually forwards as far as the throat as possible. The dog was then anæsthetised and the jaws opened widely with a gag. The ball could then be seen and was extracted by hooked forceps. The dog was returned quite recovered to its owner the same day.

Abstracts.

[**"Milk Fever Considered in the Light of Recent Researches."** (Förlossningslamhet, paresis puerperalis, i belysning av senare underökningar). Stalfors, H., and Lagerlöf, N. *Skand: Vet-tidskrf,* 1930, 161-180.]

Gives a full review of the hypothesis pertaining to milk fever and the mechanism of its relief. Deals at length with the Hypo-calcæmia theory as postulated by Dryerre and Greig, Widmark and Carlens and Little and Wright.

A series of 33 cases of milk fever and their treatment are recorded in detail. All were given $CaCl_2$ intravenously, except two which received Ca-gluconate. Twenty patients received 30 grams $CaCl_2$ in 500-1,000 c.cs. H_2O. For the remainder, the dose was increased to 40 grams. The jugular vein was utilised, occasionally the mammary. The majority of the cows treated improved quickly after injection, some appearing brighter and commencing to eat within a few minutes. In ten cases a relapse occurred, four such being among those which had received 40 grams of Ca. Such cases were treated by udder inflation and a second Ca. injection, when recovery followed. In four cases phlebitis of the jugular developed. One was due to malignant œdema infection. In the remainder there was either an escape of solution into the perivascular tissues or a marked distention of the jugular during the injection, so that the latter was slow and difficult and had to be completed in the mammary vein. The cause of this dilatation is not clear, but it is not peculiar to Ca. injection, having been observed during blood transfusion in treating piroplasmosis. The authors conclude that owing to the high percentage of relapses $CaCl_2$ therapy has a limited use. It is indicated chiefly in cases of relapse following inflation and only then combined with a second inflation.

Milk fever with a co-existent mammitis can be treated with Ca. Intravenous $CaCl_2$ treatment has three disadvantages: (1) the high proportion of relapses; (2) risk of phlebitis with necrosis; (3) the comparative cost of the method.

There is no mention as to whether the Ca-gluconate caused phlebitis in the two instances in which it was tried.

G. B. B.

[**"Remarks on Cooling Chambers and Changes occurring in Meat during Storage in Cooling Chambers."** (Nagra ord om kylhus och viktförlust hos kött vid förvaring i kylhus). Flyborg, S., *Skand: Vet.-tidskrf,* 1930, 5, 80-93.]

Discusses the changes which occur in meat during storage in cooling chambers under two heads: (1) The changes in chemical composition and in texture associated with the production of lactic acid by fermentation of sugar and glycogen present in the tissues; (2) The changes in weight. These depend on (*a*) the type of animal; (*b*) the quality of the carcass; (*c*) the temperature and humidity of the atmosphere; (*d*) the length of time the meat is stored. Under (*a*) figures are quoted giving the H_2O content of the flesh of different animals. Under (*b*) the effect of fat on the rate of evaporation is studied. Since fat has a low H_2O content, loss of weight is slower in the carcass of animals in good condition; (*c*) the effects of temperature and humidity of the atmosphere, together with the rate of circulation of the air of the chamber, are discussed; (*d*) under this heading the actual and comparative loss of weight during successive days is shown by graphs and figures are given for each of the domestic animals used for food, including the horse.

G. B. B.

Reports.

[**Veterinary Department of the City of Edinburgh.** Annual Report for the Year 1929.]

We are in receipt of the report for 1929 prepared by Mr. Arthur Gofton, Chief Veterinary Inspector of the City of Edinburgh, which, as usual, contains much of interest from a Veterinary Public Health standpoint. The report, as in previous years, consists essentially of three sections:—(*a*) The Milk and Dairies (Scotland) Act, 1914; (*b*) the Report of the Bacteriological Laboratory and (*c*) the Inspection of Meat and other Foods, including a short summary of the food inspection at the Port of Leith.

(*a*) *The Milk and Dairies (Scotland) Act of* 1914.—The usual practice in Edinburgh of submitting all cattle on registered dairies to a monthly inspection has been continued and 856 visits for this purpose have been paid. In addition, 75 visits were made to examine cows on non-registered premises within the city. The cows on registered premises totalled 3,321 and those on unregistered premises 69. An application was received for registration as a dairy of premises used for keeping goats, as the owner proposed developing a business for the sale of goats' milk. After consideration as to whether goats could be considered as "cattle," the Local Authority granted a licence, but the proposal of developing the business never materialised. There were 18 goats on the premises in question. During the year, 2,936 newly-calved cows were exposed for sale in the markets of the city, or an average of 56 per week.

These were all examined and three were found to have tuberculosis of the udder and four to have chronic coughs and to be showing definite clinical signs of tuberculosis. These were all ordered out of the market under Article 12 of the Tuberculosis Order. Five were slaughtered by their owners at their own risk, one was sent to its place of origin, the Local Authority of that area being duly informed, and the remaining animal was slaughtered under the provisions of the Tuberculosis Order. In addition to these, seven cows suffering from diseases other than tuberculosis were discovered in the market and withdrawn from sale by their owners.

Apart from tuberculosis, 118 diseased cows were noted on inspection in city byres. The cows in question were removed permanently or temporarily from the herds as occasion demanded and the milk withdrawn from sale when considered necessary. The conditions met with were as follows :—

Suppurating conditions of udders or teats ...	8
Septic metritis	3
Psoroptic mange and ringworm	29
Jöhne's disease and emaciation	3
Mastitis	49
Retained placenta	2
General disorders	24

Tuberculosis in Dairy Cows.—During the year, 12 cows were found in city byres to be tuberculous within the meaning of the Tuberculosis Order. Five of these had tuberculosis of the udder, two were the subjects of tuberculous emaciation and five had chronic coughs along with definite clinical signs of the disease. Of the five tuberculous udders, microscopic examination of the milk was responsible for demonstrating tubercle bacilli in the milk in three cases, while in two it was necessary to resort to the biological test for confirmation. Microscopic examination of expectorate was successful in demonstrating tubercle bacilli in two of the other cases dealt with under the Order, clinical examination alone was used in diagnosing four and the tuberculin test (double-intradermal) was used on only one occasion. In no case was the tuberculin test used under powers contained in Section 22 of the Milk and Dairies (Scotland) Act. A further 15 cows were proved to be tuberculous by the examination of pathological matter obtained from them, but, not falling within the scope of the Tuberculosis Order, they were removed from the herds and sold for slaughter by the owners concerned. This brings the number of tuberculous cows removed from dairy herds or from the Gorgie cattle market during the year to 34.

There has been no appreciable falling off in the number of cases of tuberculosis as revealed by the examination of cows slaughtered in the city abattoirs. Tuberculosis was found in 1,644 cows so slaughtered or 29·4 per cent. as against 41·84 per cent. the previous year. Of these, it is stated, 10·71 per cent. were totally condemned against 9·45 per cent. in 1928, while in 21·59 per cent. the disease was moderately extensive and in 69·70 per cent. it was limited in extent or more or less localised.

The cattle on the farm licensed as a tubercle-free herd under the Milk (Special Designations) Order for the sale of " Certified " milk were tested twice with tuberculin, 45 animals on the first test and 48 on the second. No reaction occurred during the year. The young stock from this farm are kept on hill grazings and 62 animals were tested in the spring and 49 in the autumn. One doubtful reaction was recorded in the spring test and the animal in question sold.

At the end of the year there were 88 registered premises in the City, containing 3,321 cows, and 31 unregistered containing 69 cows. The unregistered premises were all licensed under the Cattle Sheds in Burghs (Scotland) Act of 1866.

Under Section 18 of the 1914 Act, 107 samples of milk consigned to the City from other districts were submitted to the biological test for tuberculosis. Of these only four proved to be tuberculous. The investigations of these positive samples entailed five visits being paid to the farms concerned and the examination of 162 cows in conjunction with the officers of the Local Authorities concerned. In three cases the cows responsible were located and slaughtered under the Tuberculosis Order. It is to be noted that the percentage of tuberculous milk samples has been lower than the average of past years. The licence to the one " Grade A" farm in the City has been continued and the conditions of the licence fulfilled. Milk sold in the City under the Milk (Special Designations) Order has been regularly sampled and subjected to bacteriological examination. One hundred and thirty-five such samples have been taken, including 33 of pasteurised milk. In one case where coliform organisms were constantly recurring it finally transpired that their presence was due to two cows, each of which was constantly found to be excreting coliform organisms from one quarter. No abnormality could be detected in these animals clinically. The milk supplied to the City Hospitals is obtained from a Corporation farm of tubercle-free cows, whose number has now been completed. The average number of cows in milk last year was 75 and the milk produced 60,200 gallons. The herd was maintained tubercle-free and the milk recording gave an overall average of 765 gallons with a butter fat content of 3·79 per cent., the cows being Ayrshires. The standard of cleanliness obtained was that of " Certified " milk.

(b) The Bacteriological Laboratory.—Mr. W. Jowett, F.R.C.V.S., D.V.H., submits this report. One hundred and forty-six samples of milk were submitted to bacteriological examination during the year. Seven out of 53 samples of " Certified " milk and nine out of 15 " Grade A" milk, failed to conform to the required standard, but this lapse was only temporary. Out of 33 samples of pasteurised milk, nine failed to conform to the required standard so far as living bacteria were concerned, but in 16 coliform organisms were present in 1/10 c.c.—a high percentage. Mr. Jowett expresses the opinion that judging from the results recorded in his laboratory, the standard of " Certified " and Graded milks could be raised without any undue hardships being inflicted on the producers. He also considers that ordinary " market milk " ought to be made to conform to a reasonable standard of cleanliness. Out of 93 samples of milk taken from individual cows in City byres, six were found to contain tubercle bacilli on microscopic examination and two out of eight which were submitted to the biological test. A table is given showing the percentage of country milks proving to be tuberculous over a period of years, the average for the last 12 years (both years inclusive) being 7·8 per cent., so that the present year, when only 3·7 per cent. were found to be tuberculous, compares very favourably.

Investigations were carried out to see if " Caseous lymphadenitis " in sheep—prevalent in certain meat exporting countries—occurred amongst locally killed sheep. No case of the disease was met with in sheep slaughtered locally. A case in which swine erysipelas was transmitted to a human subject was met with, but fortunately it proved to be non-fatal.

(*c*) *The Inspection of Meat and Other Foods.*—As heretofore, a veterinary officer is detailed for duty in the markets on each market day. Special observations are kept to avoid cases of cruelty and to see that animals are in a fit state to travel. The number of fat stock passing through the markets was as follows :—cattle, 46,461 ; calves, 5,824 ; sheep, 231,449 ; swine, 21,479.

Abattoirs.—A total of 197,054 animals passed through the City abattoirs in 1929, comprising 33,361 cattle, 4,791 calves, 143,316 sheep and 15,586 swine. A total of 132·16 tons of meat were condemned during the year, but if to this is added the approximate weight of the offal, the enormous figure of 183·23 tons is reached, which shows an increase of 25·51 tons as compared with the preceding year. Tuberculosis was responsible for 57·3 per cent. of the carcass seizures and for 37·43 of the offal seized. Tables are appended giving the details of these seizures, which make interesting reading. The percentage incidence of tuberculosis during the year was as follows :—oxen, 4·69 ; bulls, 19·78 ; cows, 39·40 ; heifers, 8·12, making a percentage of 8·98 for all cattle. Only 4·90 per cent. of the pigs were affected with tuberculosis and 0·71 per cent. of the calves. Approximately 41,378 carcasses were imported into the City for sale in the wholesale dead meat markets. In addition, considerable quantities of frozen boneless meat, kidneys, livers, tripe, etc., were received. One successful prosecution was brought against a butcher in respect to a cow carcass sent to one of the meat markets from Berwickshire and a fine of £25 imposed.

Visits to the number of 5,417 were paid to shops and other premises used for the preparation of foodstuffs and their general cleanliness supervised.

Port Inspections. At the port 4,634 different consignments of foodstuffs were examined, coming from 11 different countries and 147 tons 19 cwts. 49 lb. of these were condemned. This gives a total of 351 tons 15 cwts. and 94 lb. of foodstuffs condemned in the city during the year.

To the City stud of horses 646 visits were paid and 21 horses were inspected prior to purchase, and no less than 180 visits were paid to the Corporation farms for the treatment of sick or parturient animals.

The report shows the large amount of work falling on a well-equipped veterinary service in one of the large cities and the importance such a service can assume.

[**Veterinary Department, Uganda Protectorate.** Annual Report for 1929.]

The report is written by Mr. U. F. Richardson, Acting Director of Veterinary Services. It is an interesting account of the activities of the Department and is accompanied by a map.

Rinderpest occupied much of the attention of the veterinary staff during the year and, although the results of preventive inoculation were not altogether satisfactory, administrative methods met with considerable success in controlling the movements of infected cattle. The maintenance of infection by game is a difficult problem which is dealt with by special measures. As stated in the report, it would probably be advantageous if rinderpest anti-serum could be produced locally. The cattle of most of the areas of the Protectorate are highly susceptible to rinderpest and a serum of high titre is required.

Work is greatly handicapped by the absence of a proper laboratory and buildings for research and educational purposes. The work of training native veterinary assistants requires to be developed. A site for a laboratory has been tentatively selected in Entebbe and it is to be hoped that progress can soon be reported.

The Division of Animal Husbandry deals with the trade in slaughter cattle, the maintenance of stock farms, meat and milk supply and trade in hides and skins.

The economic value of the Department is well demonstrated and extended activities are eminently desirable.

N.V.M.A. Divisional Reports.

Eastern Counties Division.*

Meeting at Cambridge.

A meeting of the Eastern Counties Division, N.V.M.A., was held at the Institute of Animal Pathology, Cambridge, on Friday, July 25th.

The President (Professor J. B. Buxton) occupied the chair, and there were also present Messrs. H. R. Allen, W. J. Bambridge, T. E. Barcham, T. J. Bosworth, G. L. Bradley, V. Boyle, S. Bennett, E. A. Burgon, J. Buckingham, J. M. Buchanan, G. F. Castle, B. A. Claxton, W. H. Dennett, F. L. Gooch, R. E. Glover, T. G. Heatley, H. Loveless, G. T. Matthews, C. C. Nesling, E. B. Reynolds, W. Shipley, J. C. Taylor, P. R. Turner, P. Welch, W. H. Wortley, and the Hon. Secretary, W. A. Wood.

The President extended a hearty welcome to the visitors, who were, N. S. Barron, R. Burgess-Smith, P. Crosfield, J. S. Dalzell, A. C. Fraser, W. Graves, F. W. L. Gooch, E. W. Hall, J. R. M. Innes, J. Polding, D. W. Menzies, J. A. Nicholson, G. D. Shearer, R. A. Hammond, P. R. Thompson, C. W. Townsend, R. D. Watson, A. J. Wilsdon, W. G. Wragg, and W. Bishop Young.

The minutes of the previous meeting, which had been published in the *Veterinary Record*, were taken as read and were confirmed and signed.

Correspondence.—Letters of apology for non-attendance from Messrs. H. L. Roberts, H. V. Low, J. F. Thurston, J. Smith, H. Buckingham and M. Bray.

Obituary.—The Chairman (Professor Buxton), said : " It is my painful duty to have to refer to the death of one of our members, Mr. V. Pride-Jones, of Newmarket. We did not see as much of him as we should have liked at our meetings, but that was our misfortune. Mr. Pride-Jones was one of those who never failed to maintain the prestige of his profession, and his death at an early age is a serious loss to us. I move from the Chair that a vote of condolence be sent to those he has left behind. Will you kindly show your sympathy in the ordinary way."

---

* Received on August 2nd, 1930.

The members stood in silent tribute.

Election of new members—The President said he had much pleasure in proposing two new members, viz., Professor E. Brayley Reynolds and Captain Bambridge. Mr. Reynolds had for a long time been an Honorary Associate of the Society, but now that he was a permanent resident in the Eastern Counties area he had expressed a wish to become an ordinary member. Messrs. E. B. Reynolds and W. J. Bambridge of Newmarket, G. L. Bradley of the Ministry of Agriculture, J. C. Taylor of Beccles, and G. H. Leader of Newmarket, having been duly proposed and seconded, were unanimously elected membrs of the Society.

Next meeting.—The Chairman announced that the next business was to decide on the place at which the September meeting should be held and he would be glad to have suggestions. The Hon. Secretary proposed Ipswich.

Mr. P. R. Turner proposed, as an amendment, that the next meeting should be held early in September at Woodbridge with a view to holding at the same time the Bowls Tournament for the Shipley Cup.

Major T. G. Heatley seconded the amendment, and invited the members to use his bowling green after the business meeting.

The amendment was put and carried.

Morbid Specimens.—A number of pathological specimens were now exhibited by Mr. H. Loveless, who gave histories of them. [These histories are reproduced in the Clinical Section of this issue of the *Record*.—Ed.]

Double-Intradermal Testing.

Mr. R. E. Glover, having made some observations on the double intradermal tuberculin test (which are published elsewhere in this issue) proceeded to describe the method of applying the double intradermal Johnin test for the diagnosis of Johne's disease. He pointed out that the Johnin test was similar to the tuberculin test with the exception that the dose employed was 0·2 c.c. In interpreting the results, it was equally important to fix in the mind the nature of the non-reacting swelling, and, in cases of doubt, the use of a concentrated glycerine broth could be recommended. In cattle affected with Johne's disease, very large swellings were not to be anticipated, and hence any deviation from the negative swelling should be regarded as a reaction.

The method of preparing rectal smears for laboratory examination was also described, and the relative value of this means of diagnosis was discussed.

Demonstrations.

The different types of swellings in tuberculous cattle and those affected with Johne's disease were illustrated in demonstration animals.

A number of calves which had been successfully immunised against tuberculin by the B.C.G. method were on view. A series of slides was exhibited showing various bacilli that are commonly met with when examining blood smears for anthrax, and typical anthrax smears were also shown.

Various types of apparatus for injecting large quantities of fluid were exhibited; one of these was capable of being easily made up by any veterinary surgeon.

Preparations of many of the common parasitic round worms of the horse, sheep and pig were put on view, and a simple routine method of making egg counts of parasitic worms by the sugar flotation method was demonstrated.

All these demonstrations were viewed by those present with great interest.

Major T. G. Heatley then proposed a vote of thanks to the President and members of the Institute of Animal Pathology for the very interesting talks and demonstrations. This was seconded by Mr. W. H. Wortley and carried by acclamation.

The President entertained the members and visitors to tea, this concluding a most successful and enjoyable meeting.

W. A. Wood, *Hon. Secretary.*

North Wales Division.*

The Corwen Meeting.

A meeting of this Division was held at the Owen Glyndwr Hotel, Corwen, on Friday, July 11th. The President, Mr. J. H. Wynne, occupied the chair and the following members were present:—Messrs. Bate, Booth, Broome, Cane, Cartwright, T. W. Hughes, W. Hughes, L. Jones, R. Jones, Dr. Share-Jones, Messrs. W. O. Jones, Lewis, Wynne Lloyd, Matthews, Mills, Dr. Montgomerie, Messrs. Roberts, Savage, H. Williams, and H. V. Hughes (Hon. Secretary). An apology for inability to attend was read from Principal Hobday.

After the minutes of the last meeting had been confirmed, the President referred to the large number of visitors present. These included Messrs. Davies, Downham, Edwards, Evans, Gordon, J. Hughes, Lawson, Platt, J. C. Rowlands, W. T. Rowlands, Dr. Wade, and Mr. R. Wynne Williams, and the President assured them of a very hearty welcome.

Correspondence.

(1) *Victoria Veterinary Benevolent Fund.*—The Annual Report of the Victoria Veterinary Benevolent Fund was circulated and the Secretary suggested that the Society should send a donation to the Fund as other Societies were doing. It was agreed to send a donation of £2 2s. The Institution's box was circulated among the members during the meeting and the resulting collection amounted to £1 7s. 1d.

(2) *N.V.M.A. Council.*—The President was nominated to serve with the Secretary on the Council of the N.V.M.A. during the forthcoming year.

(3) The Secretary reported that he had received a reply to the recommendations which the society had sent to the N.V.M.A. regarding the measures adopted in dealing with sheep scab. It was agreed to refer the letter to the committee which had originally dealt with the matter.

(4) A letter from the Organising Secretary of the International Veterinary Congress was read. Professor Share-Jones commended the letter to the attention of members and appealed to them to support the Congress. It was suggested that any members wishing to form a party intending to travel to London together should communicate with the Secretary.

(5) An invitation from the Lancashire Division, N.V.M.A. to attend their summer meeting at Chester was read and it was agreed that the hearty thanks of the members be conveyed to the President and Council of the Lancashire Society for their kind invitation.

(6) A letter was read from Dr. Montgomerie, referring to a letter circulated to the North Wales practitioners in

* Received on August 7th, 1930.

connection with Veterinary Advisory work at Bangor College. It was agreed to defer consideration of the letter until the next meeting.

A letter from Mr. Salusbury of Tanganyika thanking the members for the privileges conferred upon him was also read.

Nominations.—The following gentlemen were nominated for membership—Messrs. T. M. Evans (Caernarvon), R. M. Lawson (Ruthin), R. Platt (Llangollen), J. C. Rowlands (Llanrhaiadr), and R. Wynne Williams (Dolgelley).

Papers.—The President then called upon Mr. Richard Jones to give an address on "Some Clinical Cases." "We all know Mr. Jones," said the President "to be a strong supporter of the Society, which he has served well for many years as its Treasurer. But we also recognise him to be an excellent surgeon. I am sure we are all glad of the opportunity to hear him this afternoon." (Applause.)

[Mr. Jones' paper will be published later, when received. —Ed.]

The President thanked Mr. Jones for his very interesting address and he invited discussion on the cases. Mr. Wynne Lloyd, however, suggested that as there was so much other business to be attended to that afternoon it would be wiser to postpone discussion of the address until the next meeting when, after its publication, the paper would receive the attention which it merited. This was unanimously agreed to.

The President next called upon Mr. K. D. Downham of Liverpool. They were very pleased to have Mr. Downham with them that afternoon, said the President, and they looked forward to an interesting address on the subject of "The Double Intradermal Tuberculin Testing of Cattle."

[Mr. Downham's paper is reproduced, together with the discussion upon it, earlier in this issue of the *Record*.—Ed.]

Mr. Downham proceeded to illustrate his remarks by means of lantern slides, explaining the features of each as he went on. The exhibition was most informative and added to the interest of the address.

The meeting was then adjourned, when the members and visitors were entertained to tea at the hotel by the President. Professor Share-Jones proposed and Dr. Montgomerie seconded a vote of thanks to Mr. Wynne for his generous hospitality.

Demonstrations.

After tea the members gathered in the hotel yard to view the demonstration animals. Six cows and a calf had been tested. The calf had received milk from a cow with a tuberculous udder and although only a few weeks old it gave a definite positive reaction.

Five other animals gave positive reactions and two passed the test. *Post-mortem* examination confirmed these results.

In the case of one cow tubercle bacilli were found in the milk and sections showed the udder to be tuberculous. Smears from this animal's uterus contained many tubercle bacilli. Mr. Downham gave a demonstration of his method of injecting both in the neck and in the caudal fold. He explained the significance of the reactions and, for comparison, showed swellings resulting from the injection of tuberculin, concentrated sterile broth, and normal saline. Several members also performed the injection.

In the yard Mr. R. L. Lewis gave a demonstration of a new cord-holding forceps which he has devised for use with the Burdizzo castrator. The forceps, which have been patented, have for their object the holding of the spermatic cord between the jaws of the castrator, thus preventing the unfortunate accident of the cord escaping from the jaws of the castrator, which would necessitate a second operation. Mr. Lewis informed the members that Messrs. Arnold are the sole distributors of the forceps, the price of which is 20s. It was agreed that the forceps were a very useful adjunct, and Mr. Lewis was generally congratulated on his successful venture.

A vote of thanks was then proposed to Mr. Richard Jones and Mr. Downhaan for their valuable contributions to the success of the meeting; to Dr. Montgomerie for his interesting address in opening the discussion; to Mr. L. Llewellyn Jones for his generous assistance in obtaining the animals and to Mr. A. E. Edwards for operating the lantern. This was carried with acclamation and the meeting terminated.

Howel V. Hughes, *Hon. Secretary.*

From The Veterinarian,

August, 1830.

An Account of a Monstrosity, Partaking of the Peculiarities of a Cow and Horse.

By Mr. J. W. Gloag, V.S.

About 18 months since, I was at Greenwich, and my curiosity was excited upon hearing that a monstrosity was then exhibiting, partaking of the peculiarities of the cow and horse. The animal seemed to be about 15 hands high (a mare, if I dare call her so), of the commonest description, and three years and a half old. The most striking peculiarities were in the tail, hips, head, breast, and off fore leg. The off fore leg, from its singularity, claimed my first attention; and I was induced to examine it with great care, as, at first sight, I suspected it might have been the result of disease. The shoulder-blade and the humerus seemed to be shorter and more upright than usual, and the latter bone was thicker, and turned very much outwards. This leg was, in every respect, similar to a cow's, but the similarity was still more evident when I descended to the foot. There were two hoofs, with separate joints, and a natural secretion between them. There was no sign of a frog, but the animal trod upon her heels, and used the foot precisely as a cow. I walked her round the stable several times, and it was really ludicrous to observe the difference in the manner of progression between the two legs. The colour of the hair on the body seemed to present a strange mixture between that of both animals; but it was long, soft, and loosely attached. The head had a very curious appearance; it seemed to be broad at the poll, and the ears were very large, and rounded, and turned backwards and inwards, and covered with long, shaggy hair. The lower part of the face projected very much on each side, giving a width very dissimilar to the face of the horse. There were six incisor teeth in each jaw, but very unevenly distributed; and they seemed to partake much of the mixed character. The breast was wide and hung down, strongly resembling the dewlap. The body, neck, and near fore leg, resembled those of the horse. The hips, tail, and hind legs above the hock, were exactly similar to those of a cow. The spinous and transverse process of the ileum projected very much, and the pubis stretched backwards, giving that great prominence of the bones of the ischium always so observable in a cow. The sacral processes did not project, and the tail did not arch over the pubis, as in the horse, but seemed to fall more abruptly; it was shaved

nearly to its tip, where was left a tuft of hair, which was frizzled, and very like that of a cow. The tail felt very fleshy, and at its base the skin was loosely attached; and the vagina was without colour, and hung down as in a cow. The patellæ were very thick and large, nor was the udder unnaturally distended. At this time I related the facts to many veterinarians, and among other to Mr. Sewell.

A short time since I called upon Mr. J. Skilt, V.S., at Southwark Bridge, and he informed me that he had seen the skelton of a very strange animal at the knacker's line and wished me to go and examine it with him. I did so; and was much surprised and pleased once more to have an opportunity of surveying the monstrosity I have just been describing; and I am enabled to add the following particulars to my previous description of her:—The occipital and pterygoid processes are large, and the former very broad and projecting, and differing from the triangular-shaped process of the horse. There are no signs of horns. Just above the three anterior molars on each side is a large projection, similar to specimens of disease wherein the teeth have still remained in their sockets. The three first molars are perfect cow's teeth. The ileum and pubis are laid nearly flat, as in the cow. The number of ribs and vertebræ are the same as in the horse. All the joints seem to be unusually large. The greatest peculiarity is, however, in the off fore foot; and I am sorry that, from the tenacity of the knacker respecting it, I am obliged to be very concise in my account of it. Articulating with the lower head of the large metacarpal bone is another, altogether shorter and broader than the large pastern of the horse, and cleft nearly to its middle; and, articulating with each division, are the remaining small bones of the foot. There are two hoofs, separately joined, with a natural secretion between them; but they have grown enormously since I saw the animal alive. The knacker informed me that he did not perceive anything in the stomach different from that of the horse. Any gentleman who wishes for more information can examine this, and many other curious specimens, at Winkley's Yard, in Fryer's Street, Borough. The only history I could learn of the animal was, that the owner had purchased her from the breeder, who stated that her dam, when very old, had been put out on Finchley Common with a bull; that no horse could have access to her; and that this very singular animal was probably the offspring of the mare and the bull.

Notes and News.

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events.

Sept. 15th.—N.V.M.A. Editorial Committee, 2 Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

Sept. 17th.—N.V.M.A. Committee Meetings at 2 Verulam Buildings, Gray's Inn, W.C.1:—Nominations Committee, 3.30 p.m.; Finance Committee, 4 p.m.

Sept. 19th.—Meeting of the Eastern Counties Division, N.V.M.A., at Woodbridge.

Personal.

Birth.—Taylor.—On September 2nd, at Allmett House, Winsford, Cheshire, to Dorothy Taylor (née Bibbey) wife of Mr. Jas. T. Taylor, M.R.C.V.S., a son.

In the reorganisation and extension of the activities of the veterinary service in Cyprus the title of Mr. R. J. Roe, M.R.C.V.S., D.V.S.M., has been altered from Government Veterinary Surgeon to Chief Veterinary Officer, and Mr. F. H. Manley, M.R.C.V.S., B.V.SC., has been appointed Veterinary Officer. Mr. Manley, who has previously served in Uganda and in Nigeria, proceeded to Cyprus last June and will be engaged primarily in vaccine-production, laboratory work and research.

The British Association.

The proceedings of the British Association this year, at Bristol, cover much ground which is of more than ordinary interest to the veterinarian, and we shall devote space in forthcoming issues to some portion of them. It is particularly worthy of note that this was the first occasion upon which a veterinarian has occupied the chair of the Agricultural Section, Dr. P. J. Du Toit, of South Africa, having, as he expressed it, "travelled 6,000 miles to fill a position which was an honour to his profession and his country."

Errata.—Mr. S. E. Sampson, Sheffield, writes:—"In your issue of 6th, you report me as having given '℥i of Calcium Sandoz in ℥i H_2O,' which would be a physical impossibility. It should read, however: '℥i. C. Sandoz in Oi (1 pint) H_2O.' with the other weights of the powder in similar proportions."

In our report of the Bridgwater meeting of the Mid-West and South Wales Division, N.V.M.A., read, on page 848 of our last issue, 104° F. as the third day temperature reading of the West Highland bitch which was the subject of the operation of lithotomy.

Correspondence.

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The Editor does not hold himself responsible for the opinions of his correspondents.

Tetanus.

To the Editor of The Veterinary Record.

Sir,—I hoped that the recent articles and correspondence on tetanus would have elicited more information as to the value of antitoxin.

I especially hoped we should have had some information from the R.A.V.C., as a very large quantity was used during the early part of the War. The supply was stopped suddenly, probably for economic reasons, and I am under the impression that cases of tetanus were much fewer after the issue of antitoxin was discontinued and its value as a prophylactic was accordingly considered problematical. Statistics, of course, will prove this and may be interesting.

My experience of it as a curative in my own practice, even in very large doses, has been disappointing, and I think its value both as a prophylactic and as a curative has been much over-rated.

Yours faithfully,

Wm. Ascott (Major), O.B.E.

Bideford.

The Editor acknowledges the receipt of the following:—

Communications from Messrs. J. M. Armfield (Chipstead), W. P. Blount (Folkestone), H. Burrow (Birkenhead), Geo. H. Gould (Southampton), H. V. Hughes (Liverpool), R. Jones (Towyn), O. Stinson (Appleby).

Report of a meeting of the Lancashire Division, N.V.M.A., from Capt. J. Spruell (Hon. Secretary).

Report of a meeting of the North of England Division, N.V.M.A., from Capt. J. R. Rider (Hon. Secretary).